WHAT IS CLAIMED IS:

1. A method for depositing a film on a substrate in a process chamber, the method comprising:

providing a first gaseous mixture to the process chamber;

generating a plasma from the first gaseous mixture with a plasma source disposed within the process chamber to deposit a first portion of the film on the substrate;

thereafter, flowing an etchant gas into the process chamber without terminating the plasma to etch part of the first portion of the film; and

thereafter, providing a second gaseous mixture to the process chamber without terminating the plasma to deposit a second portion of the film on the substrate.

2. The method recited in claim 1 further comprising applying an electrical bias to the substrate while flowing the etchant gas.

3. The method recited in claim 2 wherein the bias has a power density approximately between 0.9 W/cm^2 and 3.2 W/cm^2.

4. The method recited in claim 1 wherein the second gaseous mixture is substantially the same as the first gaseous mixture.

5. The method recited in claim 1 wherein the first and second gaseous mixtures each include a silicon-containing gas and an oxygen-containing gas, and wherein the etchant gas includes a fluorine-containing gas.

6. A method for depositing a film on a substrate in a process chamber, the method comprising:

providing a first gaseous mixture to the process chamber, the first gaseous mixture comprising a first deposition gas and an etchant gas; and

generating a plasma from the first gaseous mixture with a plasma coupling structure to simultaneously deposit a first portion of the film on the substrate and etch the film, wherein the plasma includes poloidal ion flow along field lines substantially parallel to a surface interior to the process chamber and disposed to separate the plasma from the plasma coupling structure.

7. The method recited in claim 6 further comprising providing a second gaseous mixture to the process chamber without terminating the plasma, the second gaseous mixture comprising a second deposition gas, to deposit a second portion of the film.

8. The method recited in claim 6 further comprising applying an electrical bias to the substrate.

9. The method recited in claim 8 wherein the bias has a power density approximately between 0.9 W/cm^2 and 3.2 W/cm^2.

10. The method recited in claim 8 wherein the bias has a power density approximately between 0.9 W/cm^2 and 1.6 W/cm^2.

11. The method recited in claim 6 wherein the plasma is a high-density plasma.

12. The method recited in claim 6 wherein the second deposition gas is substantially the same as the first deposition gas.

13. The method recited in claim 6 wherein the first deposition gas includes a silicon-containing gas and an oxygen-containing gas, and wherein the etchant gas includes a fluorine-containing gas.

14. A computer-readable storage medium having a computer-readable program embodied therein for directing operation of a substrate processing system including a process chamber; a plasma coupling structure; a substrate holder; and a gas delivery system configured to introduce gases into the process chamber, the computer-readable program including instructions for operating the substrate processing system to form a film on a substrate disposed in the process chamber in accordance with the following:

providing a first gaseous mixture to the process chamber, the first gaseous mixture comprising a first deposition gas and an etching gas;

generating a plasma from the first gaseous mixture with the plasma coupling structure to simultaneously deposit a first portion of the film on the substrate and etch the film, wherein the plasma includes poloidal ion flow along field lines

substantially parallel to a surface interior to the process chamber and disposed to separate the plasma from the plasma coupling structure.

15. The computer-readable storage medium recited in claim 14, the computer-readable program further including instructions for applying an electrical bias to the substrate.

16. The computer-readable storage medium recited in claim 14, the computer-readable program further including instructions for providing a second gaseous mixture to the process chamber without terminating the plasma, the second gaseous mixture comprising a second deposition gas, to deposit a second portion of the film.

17. A computer-readable storage medium having a computer-readable program embodied therein for directing operation of a substrate processing system including a process chamber; a plasma generation system having a plasma source disposed within the process chamber; a substrate holder; and a gas delivery system configured to introduce gases into the process chamber, the computer-readable program including instructions for operating the substrate processing system to form a film on a substrate disposed in the process chamber in accordance with the following:

providing a first gaseous mixture to the process chamber;

generating a plasma from the first gaseous mixture with the plasma source;

thereafter, flowing an etchant gas into the process chamber without terminating the plasma to etch part of the first portion of the film; and

thereafter, providing a second gaseous mixture to the process chamber without terminating the plasma to deposit a second portion of the film on the substrate.

18. The computer-readable storage medium recited in claim 17, the computer-readable program further including instructions for applying an electrical bias to the substrate while flowing the etchant gas.

19. A substrate processing system comprising:

a housing defining a process chamber;

a plasma generating system operatively coupled to the process chamber and includeding a plasma coupling structure disposed within the process chamber;

a substrate holder configured to hold a substrate during substrate processing;

a gas-delivery system configured to introduce gases into the process chamber, including sources for a silicon-containing gas, a fluorine-containing gas, and an oxygen-containing gas;

a pressure-control system for maintaining a selected pressure within the process chamber;

a controller for controlling the plasma generating system, the gas-delivery system, and the pressure-control system; and

a memory coupled to the controller, the memory comprising a computer-readable medium having a computer-readable program embodied therein for directing operation of the substrate processing system, the computer-readable program including

instructions to control the gas-delivery system to provide a first gaseous mixture to the process chamber, the first gaseous mixture comprising a first deposition gas that includes the silicon-containing gas and the oxygen-containing gas and an etchant gas that includes the fluorine-containing gas; and

instructions to control the plasma generating system to generate a plasma from the first gaseous mixture to simultaneously deposit a first portion of the film on the substrate and etch the film, wherein the plasma includes poloidal ion flow along field lines substantially parallel to a surface interior to the process chamber and disposed to separate the plasma from the plasma coupling structure.

20. The substrate processing system recited in claim 19, the computer-readable program further including instructions for applying an electrical bias to the substrate.

21. The substrate processing system recited in claim 19, the computer-readable program further including instructions for providing a second gaseous mixture to the process chamber without terminating the plasma, the second gaseous mixture comprising a second deposition gas, to deposit a second portion of the film.

22. A substrate processing system comprising:

a housing defining a process chamber;

a plasma generating system operatively coupled to the process chamber, the plasma generating system including a plasma source disposed within the process chamber;

a substrate holder configured to hold a substrate during substrate processing;

a gas-delivery system configured to introduce gases into the process chamber, including sources for a silicon-containing gas, a fluorine-containing gas, and an oxygen-containing gas;

a pressure-control system for maintaining a selected pressure within the process chamber;

a controller for controlling the plasma generating system, the gas-delivery system, and the pressure-control system; and

a memory coupled to the controller, the memory comprising a computer-readable medium having a computer-readable program embodied therein for directing operation of the substrate processing system, the computer-readable program including

instructions to control the gas-delivery system to provide a first gaseous mixture to the process chamber;

instructions to control the plasma generating system to generate a plasma from the first gaseous mixture with the plasma source to deposit a first portion of the film on the substrate;

instructions to control the gas-delivery system to flow, thereafter, an etchant gas into the process chamber without terminating the plasma to etch part of the first portion of the film; and

instructions to control the gas-delivery system to provide, thereafter, a second gaseous mixture to the process chamber without terminating the plasma to deposit a second portion of the film on the substrate.

23. The substrate processing system recited in claim 22, the computer-readable program further including instructions for applying an electrical bias to the substrate while flowing the etchant gas.